

REMARKS

Claims 1-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite. The Office Action indicates that the claims are indefinite because it is not clear what is referenced as “the substrate including the diluted aqueous sulfuric acid solution”. Claim 1 is amended to recite “the substrate with the applied diluted aqueous sulfuric acid solution”. Claim 12 is amended to recite “the substrate immersed in the diluted aqueous sulfuric acid solution”. Claims 1 and 12 are amended such that it is believed that the indefiniteness issue is overcome. Claim 8 is amended such that it is believed that the indefiniteness issue is overcome. Reconsideration of the rejections is requested.

Claims 1, 2, 8, 9, 11 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 63-271938. Claims 5-7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 63-271938. Claims 1-14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Delehanty, *et al.* (U.S. Patent No. 5,780,363) in view of JP 63-271938. In view of the amendments to the claims and the following remarks, the rejections are respectfully traversed, and reconsideration of the rejections is requested.

In the present invention as claimed in claims 1-11, a method of cleaning a substrate includes applying an aqueous sulfuric acid solution diluted by deionized water onto the substrate and cleaning contaminants on the substrate in accordance with a reaction between the diluted aqueous sulfuric acid solution with the contaminants by applying a mega-sonic energy to the substrate with the applied diluted aqueous sulfuric acid solution.

In the present invention as claimed in claims 12-14, a method of cleaning a substrate includes providing an aqueous sulfuric acid solution diluted by deionized water in a bath, immersing the substrate into the diluted aqueous sulfuric acid solution and cleaning contaminants on the substrate in accordance with a reaction between the diluted aqueous sulfuric acid solution and the contaminants by applying a mega-sonic energy to the substrate immersed in the diluted aqueous sulfuric acid solution.

JP 63-271938 discloses, after an ultraviolet radiation treatment, a workpiece is subjected to a cleaning treatment. The cleaning treatment including immersing the workpiece in one vessel of concentrated sulfuric acid, then immersing the workpiece in one vessel of pure water, and further immersing the workpiece in a isopropyl alcohol (IPA). Ultrasonic cleaning was performed by propagating ultrasonic waves into the IPA solution. Instead of immersing the workpiece in a cleaning solution, a method of spraying a cleaning solution can be used.

JP 63-271938 fails to teach or suggest a method of cleaning a substrate that includes applying an aqueous sulfuric acid solution diluted by deionized water onto the substrate, as claimed in claims 1-11. Instead, in JP 63-271938, concentrated sulfuric acid is applied to the workpiece rather than an aqueous sulfuric acid diluted by deionized water. In addition, JP 63-271938 fails to teach or suggest a method of cleaning a substrate that includes cleaning contaminants on the substrate in accordance with a reaction between a diluted aqueous sulfuric acid solution with the contaminants by applying a mega-sonic energy to the substrate with the applied diluted aqueous sulfuric acid solution, as claimed in claims 1-11. Instead, in JP 63-271938, the ultrasonic cleaning was performed by propagating ultrasonic waves into the IPA solution, rather than the concentrated sulfuric acid.

JP 63-271938 fails to teach or suggest a method of cleaning a substrate that includes providing an aqueous sulfuric acid solution diluted by deionized water in a bath and immersing the substrate into the diluted aqueous sulfuric acid solution, as claimed in claims 12-14. Instead, in JP 63-271938, the workpiece is immersed in concentrated sulfuric acid, rather than an aqueous sulfuric acid diluted by deionized water. In addition, JP 63-271938 fails to teach or suggest a method of cleaning a substrate that includes cleaning contaminants on the substrate in accordance with a reaction between a diluted aqueous sulfuric acid solution and the contaminants by applying a mega-sonic energy to the substrate immersed in the diluted aqueous sulfuric acid solution, as claimed in claims 12-14. Instead, in JP 63-271938, the ultrasonic cleaning was performed by propagating ultrasonic waves into the IPA solution, rather than the concentrated sulfuric acid.

JP 63-271938 fails to teach or suggest certain elements of the invention set forth in claims 1-11 and 12-14. Specifically, JP 63-271938 fails to teach or suggest that a method of cleaning a substrate includes applying an aqueous sulfuric acid solution diluted by deionized water onto the substrate and cleaning contaminants on the substrate in accordance with a reaction between the diluted aqueous sulfuric acid solution with the contaminants by applying a mega-sonic energy to the substrate with the applied diluted aqueous sulfuric acid solution, as claimed in claims 1-11. In addition, JP 63-271938 fails to teach or suggest that a method of cleaning a substrate includes providing an aqueous sulfuric acid solution diluted by deionized water in a bath, immersing the substrate into the diluted aqueous sulfuric acid solution and cleaning contaminants on the substrate in accordance with a reaction between the diluted aqueous sulfuric acid solution and the contaminants by applying a mega-sonic energy to the substrate immersed in the diluted aqueous sulfuric acid solution, as claimed in claims 12-14. Therefore, it is believed that the claims are allowable over the cited reference, and reconsideration of the rejections of claims 1, 2, 8, 9, 11 and 12 under 35 U.S.C. 102(b) as being anticipated by JP 63-271938 and of claims 5-7 and 10 as being unpatentable under 35 U.S.C. 103(a) over JP 63-271938 is respectfully requested.

Delehanty, *et al.* discloses dipping the substrate in a bath or spraying the substrate with a solution of sulfuric acid and hydrogen peroxide diluted in deionized water.

Delehanty, *et al.* fails to teach or suggest a method of cleaning a substrate that includes applying an aqueous sulfuric acid solution diluted by deionized water onto the substrate, as claimed in claims 1-11. Instead, in Delehanty, *et al.*, the substrate is sprayed with a solution of sulfuric acid, hydrogen peroxide and deionized water. In addition, Delehanty, *et al.* fails to teach or suggest a method of cleaning a substrate that includes cleaning contaminants on the substrate in accordance with a reaction between a diluted aqueous sulfuric acid solution with the contaminants by applying a mega-sonic energy to the substrate with the applied diluted aqueous sulfuric acid solution, as claimed in claims 1-11. Delehanty, *et al.*, in no way teaches or suggests applying mega-sonic energy to the substrate.

Further, Delahanty, *et al.* fails to teach or suggest a method of cleaning a substrate that includes providing an aqueous sulfuric acid solution diluted by deionized water in a bath and immersing the substrate into the diluted aqueous sulfuric acid solution, as claimed in claims 12-14. Instead, in Delahanty, *et al.*, the substrate is dipped in a bath containing a solution of sulfuric acid, hydrogen peroxide and deionized water. Delehanty, *et al.* further fails to teach or suggest a method of cleaning a substrate that includes cleaning contaminants on the substrate in accordance with a reaction between a diluted aqueous sulfuric acid solution and the contaminants by applying a mega-sonic energy to the substrate immersed in the diluted aqueous sulfuric acid solution, as claimed in claims 12-14. Delehanty, *et al.* in no way teaches or suggests applying mega-sonic energy to the substrate.

Hence, neither of Delehanty, *et al.* and JP 63-271938, as discussed above, teaches or suggests certain elements of the present invention set forth in amended claims 1-11 and 12-14. Specifically, neither of the references teaches or suggests that a method of cleaning a substrate includes applying an aqueous sulfuric acid solution diluted by deionized water onto the substrate and cleaning contaminants on the substrate in accordance with a reaction between the diluted aqueous sulfuric acid solution with the contaminants by applying a mega-sonic energy to the substrate with the applied diluted aqueous sulfuric acid solution, as claimed in claims 1-11. In addition, neither of the references teaches or suggests that a method of cleaning a substrate includes providing an aqueous sulfuric acid solution diluted by deionized water in a bath, immersing the substrate into the diluted aqueous sulfuric acid solution and cleaning contaminants on the substrate in accordance with a reaction between the diluted aqueous sulfuric acid solution and the contaminants by applying a mega-sonic energy to the substrate immersed in the diluted aqueous sulfuric acid solution, as claimed in claims 12-14. Accordingly, there is no combination of the references which would provide such teaching or suggestion. Neither of Delehanty, *et al.* and JP 63-271938, taken alone or in combination, teaches or suggests the invention set forth in the claims. Therefore, it is believed that the claims are allowable over the cited references, and reconsideration of the rejections of claims 1-14 under 35 U.S.C. 103(a) based on Delehanty, *et*

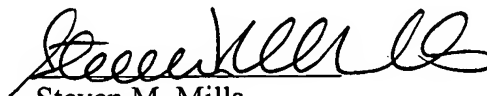
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al. and JP 63-271938 is respectfully requested.

In view of the amendments to the claims and the foregoing remarks, it is believed that all claims pending in the application are in condition for allowance, and such allowance is respectfully solicited. If a telephone conference will expedite prosecution of the application, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

Date: 6/20/06
Mills & Onello, LLP
Eleven Beacon Street, Suite 605
Boston, MA 02108
Telephone: (617) 994-4900
Facsimile: (617) 742-7774
J:\SAM\0532\amenda\amendmentsa.wpd


Steven M. Mills
Registration Number 36,610
Attorney for Applicants